

Green Synthesis and Characterization of Gold Nanoparticles using Aqueous Whole Plant Extract of *Alternanthera tenella Colla* and its Biological Activities

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ABSTRACT

Green synthesis of gold nanoparticles (AuNP) is a growing research area because of their wide applications in medicine. The present investigation deals with the biosynthesis and characterization of gold nanoparticles using aqueous extract of whole plant *Alternanthera tenella Colla* and its antioxidant and antibacterial activities. Qualitative phytochemical analysis of the plant extract showed the presence of phenols, flavonoids, steroids and saponins. Aqueous extract (pH 7 – inherent pH of the extract) was reacted with 1mM Chloro Auric acid ($\text{HAuCl}_4 \cdot 3\text{H}_2\text{O}$) and kept at room temperature. The immediate change in color from pale yellow to ruby red indicated the reduction of Au^{3+} ions to Au^0 . Gold nanoparticles (AuNP) were characterized using UV- Visible spectroscopy, TGA, SEM, XRD and FT-IR. The UV-Visible spectrum revealed the Surface Plasmon Resonance for AuNP of 5% extract and 1mM Chloro Auric acid at 500-560 nm. FTIR spectra revealed the presence of reducing groups in the extract responsible for AuNP synthesis. SEM showed the presence of polydispersed spherical AuNP. The XRD peaks at 38.42, 44.63, 64.52, 77.58 and 81.81 corresponding to [111], [200], [220], [311] and [222] showed that the AuNP were nanocrystalline in nature with fcc crystal structure. The synthesized AuNP exhibited hydroxyl free radical scavenging and reducing power activity. The gold nanoparticles isolated from *A. tenella colla* showed potent antibacterial activity against *Escherichia coli* and *Staphylococcus aureus* compared to the plant extract.